Forest Research Notes

Northeastern Forest Experiment Station

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RATING POPLARS FOR *MELAMPSORA* LEAF RUST INFECTION

Melampsora leaf rust occurs in all countries where poplars are native or where they have been introduced for ornamental use or timber culture. The rust is easily recognized by the bright orange-yellow spore masses on the undersides of the leaves during most of the growing season.

Susceptible poplars, particularly young trees, often succumb to secondary pathogens such as *Cytospora* and *Dothichiza* after several years of severe *Melampsora* infection. Highly susceptible hybrids have shown uniformly heavy infection of practically 100 percent of their leaves in mid-July, followed by almost complete defoliation in August. In nursery stool-plantings in Maine (1927 to 1935) all ramets of such highly susceptible clones died after 3 to 5 years of early and heavy infection. Recent research in Europe has shown that early and heavy rust infection has markedly decreased the growth of susceptible poplar clones and has been a very important factor favoring *Dothichiza* attack, both in plantations and in nurseries.

Fortunately, highly rust-resistant clones can be obtained by selection and breeding. However, such clones may not be equally resistant in all regions. There is no sound research evidence by which one can definitely identify the basis for this variation in susceptibility. It is probably the result of one or a combination of the following factors: (1) different species, geographic races, or physiologic strains of *Melampsora*; (2) climatic control of the pathogen; and (3) the effect of the environment on the host-parasite reaction. There is no *a priori* reason to assume that the same factors or combination of factors are always responsible for differences in the susceptibility of an individual clone under different environmental conditions. For poplars, this is an important virgin field for pathological research.

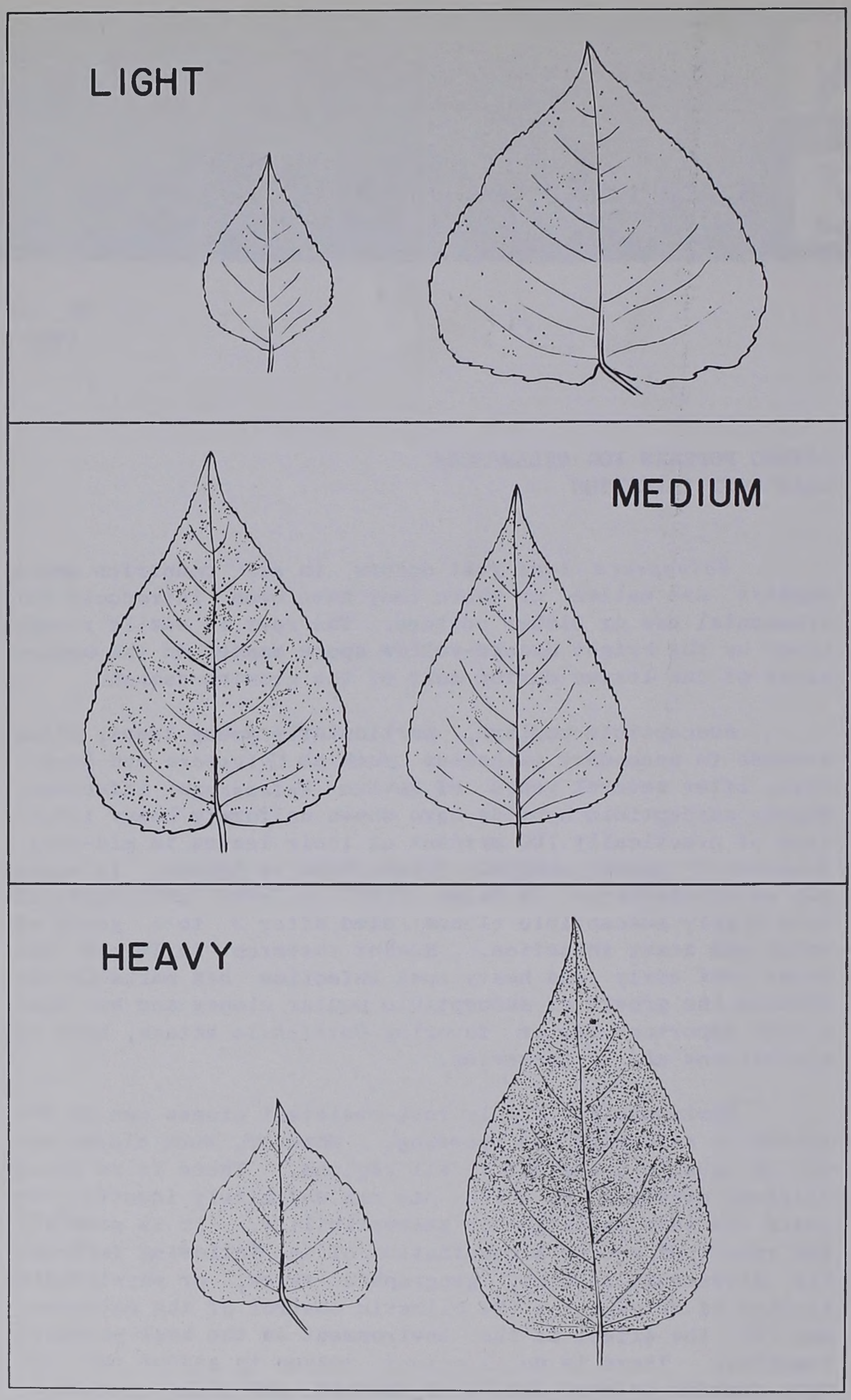

Figure 1.--The leaf diagrams used in rating severity of *Melampsora* infection.

Increasing interest in hybrid poplars for timber production in the United States has resulted in inquiries on how to evaluate severity of rust infection. During the past 20 years the author has used leaf diagrams (fig. 1) to rate leaves for light, medium, and heavy infection. Five, four, and three infection classes were used when the work was started, but it was soon apparent that more than three classes reduced the uniformity of rating for the same leaves by different observers.

Trees can be rated most effectively for rust when they are 1 to 4 years old. Numerical ratings for severity of infection of individual trees can be obtained by comparing infected leaves with the infection diagrams and estimating the percentage of infected leaves on the tree. The following numerical values have given a reasonable estimate of the observable effect of rust infection on the growth and general health of the tree:

Estimate of leaf infection		Estimate of infected leaves on tree		Estimate tree infection
Descriptive rating	Numerical rating	Percent	Numerical rating	Numerical rating
Light	1	Less than 25	1	1
		25 - 50	2	2
		50 - 75	3	3
		More than 75	4	4
Medium	5	Less than 25	1	5
		25 - 50	2	10
		50 - 75	3	15
		More than 75	4	20
Heavy	25	Less than 25	1	25
		25 - 50	2	50
		50 - 75	3	75
		More than 75	4	100

The date of observation is extremely important for estimates of the biological effect of rust on the infected trees. Poplars should be rated for rust at least twice a year, in the middle of the growing season and again before leaf-fall. On the basis of the author's observations, clones that have a numerical rust-rating of 10 or higher at mid-season for 4 years, or 25 or higher at the end of the growing season for 2 years, should not be recommended for planting in the localities where such tests have been carried on.

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